PART I - ADMINISTRATIVE

Section 1. General administrative information

Title of project

Begin Implementation Of Year 1 Of The K Pool Master Plan Program

BPA project number: 9603201
Contract renewal date (mm/yyyy): 1/1999 ☐ **Multiple actions?**

Business name of agency, institution or organization requesting funding
Yakama Indian Nation

Business acronym (if appropriate) YIN

Proposal contact person or principal investigator:

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NPPC Program Measure Number(s) which this project addresses
NPPC 1994 FWP 7.4J.4

FWS/NMFS Biological Opinion Number(s) which this project addresses
NMFS Biological Opinion, Consultation Number [383] approved the YIN Hanford K Pools supplementation program.

Other planning document references
Wy-Kan-Ush-Mi Wa-Kish-Wit: Spirit of the Salmon "Implement and refine methods for artificial propagation of white sturgeon using settling basins at the Hanford K [facilities] and other appropriate facilities"

Short description
Develop a long-term program of artificial propagation of white sturgeon for supplementation purposes using the Hanford K Pools

Target species

White Sturgeon

Section 2. Sorting and evaluation

Subbasin
Systemwide White Sturgeon (request project be moved from ISRP 98-1 Table 15 to Table 5)

Evaluation Process Sort

CBFWA caucus	Special evaluation process	ISRP project type
Mark one or more caucus	If your project fits either of these processes, mark one or both	Mark one or more categories
☐ Anadromous fish ☒ Resident fish ☐ Wildlife	☐ Multi-year (milestone-based evaluation) ☐ Watershed project evaluation	☐ Watershed councils/model watersheds ☐ Information dissemination ☐ Operation & maintenance ☐ New construction ☐ Research & monitoring ☒ Implementation & management ☐ Wildlife habitat acquisitions

Section 3. Relationships to other Bonneville projects

Umbrella / sub-proposal relationships. List umbrella project first.

Project #	Project title/description

Other dependent or critically-related projects

Project #	Project title/description	Nature of relationship

Section 4. Objectives, tasks and schedules

Past accomplishments

Year	Accomplishment	Met biological objectives?
1993	to 1998 several hundred white sturgeon were cultured by the YIN using the Hanford K Pools	This was not a BPA funded effort, but valuable experience in the culture of white sturgeon was gained by the YIN fish technicians.
1993	WDFW feasibility/demonstration acclimation of 150,000 up-river bright fall chinook salmon at Hanford K Pools	Smolts transported to Priest Rapids hatchery for release. Mortalities less than 1%. (Not BPA funded)
1994	YIN conducted acclimation and release of 500,000 URB FCS into the Hanford Reach of the Columbia River	Smolts released via pipeline from K Pools to Hanford Reach. Mortalities less than 1%. (Not BPA funded)
1995	YIN conducted acclimation and release of 700,000 URB FCS into the Hanford Reach of the Columbia River	same as 1994
1996	YIN conducted acclimation and release of 700,000 URB FCS into the Hanford Reach of the Columbia River	same as 1994 Partially BPA funded
1997	AquaGen Engineers designed a continuously flowing water system for improved K Pool system	System improvements were not installed. Fry were transported to Ringold for acclimation. (Herborn, 1997).

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Continue whitesturgeon broodstock development activities utilizing the K Pools	a	Complete white sturgeon broodstock development systems installation including river water flow-through rearing tanks, pilot scale heated water recirculation system and repairs to K Pool infracture.
		b	In cooperation with appropriate agencies and co-managers, conduct test of alternative approaches for acclimation and “domestication” of captured sub-adults to be reared for broodstock.
		c	In cooperation with appropriate agencies and co-managers, continue program of capture and transfer of

			sub-adult white sturgeon to build a population of broodstock.
2	Complete preparation of a proposal for a new white sturgeon propagation facility	a	Complete preliminary design of a new facility and submit for review, approval and funding.
		b	Complete selection of and integration of additional sites into a program for interim and/or ongoing use in conducting all phases of white sturgeon propagation activities.
3	Prepare NEPA documentation covering the full program of white sturgeon propagation		

Objective schedules and costs

Obj #	Start date mm/yyyy	End date mm/yyyy	Measureable biological objective(s)	Milestone	FY2000 Cost %
1	10/1999	9/2000			72.80%
2	10/1999	9/2000			23.20%
3	10/1999	9/2000			4.00%
					0.00%
				Total	100.00%

Schedule constraints

Hanford water use permit, NEPA and NPDES permit compliance must be addressed.
U.S. Department of Energy (USDOE) concurrence is required: USDOE and YIN must enter into a property lease agreement.
U.S. EPA concurrence is required

Completion date

A multi-year, twenty year three phase program is proposed.

Section 5. Budget

FY99 project budget (BPA obligated): $283,320

FY2000 budget by line item

Item	Note	% of total	FY2000
Personnel		%6	29,496
Fringe benefits		%1	7,462
Supplies, materials, non-		%15	66,798

expendable property			
Operations & maintenance	The sum of all items not capital		
Capital acquisitions or improvements (e.g. land, buildings, major equip.)		%11	48,276
NEPA costs	Distributed among travel, subcontracts and indirect		
Construction-related support	Application of generic facility design to selected site of new facility	%6	28,350
PIT tags	# of tags: 500	%0	1,450
Travel		%1	8,200
Indirect costs		%18	80,273
Subcontractor	GTS Duratek, Owsley	%16	71,000
Subcontractor	Anderson	%3	15,000
Subcontractor	Herborn	%2	10,000
Subcontractor	Macy	%3	15,000
Subcontractor	Forster	%1	7,000
Subcontractor	Yakama Industries	%9	39,768
Other			0
TOTAL BPA FY2000 BUDGET REQUEST			$428,073

Cost sharing

Organization	Item or service provided	% total project cost (incl. BPA)	Amount ($)
Total project cost (including BPA portion)			$428,073

Outyear costs

	FY2001	FY02	FY03	FY04
Total budget		$1,340	$1,205	$1,100

Section 6. References

Watershed?	Reference
☐	Blodgett, J., 1994, Yakama Indian Nation 1994 K Basin Fall Chinook Acclimation Project, Draft Report to the U.S. Department of Energy, Richland, Washington.

☐	CRITFC, 1996, WY-KAN-USH-MI WA-KISH-WIT: Spirit of the Salmon, The Columbia River Anadromous Fish Restoration plan of the Nez Perce, Umatilla, Warm Springs, and Yakama Tribes, Columbia River Inter-Tribal Fish Commission, Portland, Oregon.
☐	Dauble, D. D., C. S. Abernethy, H. E. Westerdahl, and B. N. Anderson, 1993, K Basin Salmon Rearing Project, Letter Report to Howard Massey, Pacific Northwest Laboratory, Richland, Washington.
☐	DeVore, J. D., B. W. James, C. A. Tracy, and D. H. Hale, 1993, Dynamics and Potential Production of White Sturgeon in the Columbia River Downstream from Bonneville Dam, Report G in Status & Habitat Requirements of White Sturgeon Populations in the Columbi
☐	DeVore, J. D., B. W. James, C. A. Tracy, and D. H. Hale, 1995a, Dynamics and Potential Production of White Sturgeon in the Unimpounded Lower Columbia River, Transactions of the American Fisheries Society 124:845-856.
☐	Hale, D. H., and B. W. James, 1993, Recreational and Sport Fisheries in the Columbia River Between Bonneville and McNary Dams, Report Q in Status & Habitat Requirements of White Sturgeon Populations in the Columbia River Downstream from McNary Dam, Volume
☐	Hatcher, L., Fiander, W., and Blodgett, J., 1999, In Press, Master Plan for Acclimation and Artificial Propagation of Salmonids and White Sturgeon at the Hanford Site K Pool Facilities, Prepared for Bonneville Power Administration, Portland, Oregon.
☐	Herborn, D. I., 1995, Contamination-Free Nature of Hanford 100-K Area Water Purification Pools, WHC-MR-0513, Westinghouse Hanford Company, Richland, Washington.
☐	Herborn, D. I., 1997, 1996-97 Annual Report, Yakama Indian Nation Hanford K Pool Acclimation and Artificial Propagation Program, (For period June 1, 1996 through May 31, 1997), contract 96-BI-94489, Bonneville Power Administration, Portland, Oregon.
☐	ISRP, 1998, Review of the Columbia River Basin Fish and Wildlife Program for Fiscal Year 1999 as Directed by the 1996 Amendment to the Northwest Power Act, Report 98-1 of the Independent Scientific Review Panel for the Northwest Power Planning Council, Po
☐	Parsley, M. J., P. J. Anders, A. I. Miller, L. G. Beckman, and G. T. McCabe, Jr., 1993, Factors Affecting Spawning and Recruitment of White Sturgeon in the Columbia River Downstream from McNary Dam, Report C in Status & Habitat Requirements of White Sturg
☐	PSMFC, 1992, White Sturgeon Management Framework Plan, Report of the White Sturgeon Planning Committee of the Pacific States Marine Fisheries Commission, Portland, Oregon.
☐	

PART II - NARRATIVE

Section 7. Abstract

The overall goal of Project 9603201 is the establishment and enhancement of populations of white sturgeon in the mid and upper Columbia River basins. The approach is to initially use existing facilities for propagation of this species as an efficient means of achieving early project start-up. The huge Hanford K Pools infrastructure can be modified and upgraded at modest costs and used for immediate implementation of the broodstock development component of the white sturgeon propagation program.

Another objective is to complete a proposal for a new white sturgeon propagation facility and to select and integrate existing facilities into a program with early start-up of other sturgeon propagation activities, such as the taking and incubation of eggs from captured gravid females.

NEPA documentation for the white sturgeon propagation program will be prepared and approved.

It is expected that within FY 2000, the adaptation of white sturgeon sub-adults to captivity will be successfully demonstrated by training fish onto artificial feed and having them exhibit weight gain.

Section 8. Project description

a. Technical and/or scientific background

a. Technical and / or scientific background

An intergovernmental contract (number 96-BI-94489) was entered into between the Yakama Indian Nation (YIN) and the Bonneville Power Administration to implement Section 7.4J.4 of the Northwest Power Planning Council 1994 Columbia River Basin Fish and Wildlife Program. Specifically, this NPPC program measure calls for an evaluation of options for using the existing Hanford Site water purification pool facilities in the 100-K Area (K Pools) to artificially propagate fall chinook salmon, coho salmon, and sturgeon. Under the contract, the YIN has prepared a document "Master Plan for Acclimation and Artificial Propagation of Salmonids and White Sturgeon at the Hanford Site K Pool Facilities" (hereafter "Master Plan"). The Master Plan was submitted to the NPPC and BPA staffs in August 1998. Upon initial review by the staffs, certain questions were raised and the plan was subsequently revised (dated October, 1998) to address the questions. Resubmittal of the Master Plan, independent review, approval and publication

are part of the FY'99 objectives to be completed under a renewal of the contract. (See last entry under Section d, Project History.)

In January 1998, the YIN submitted a proposal, the current Project 9603201 "Begin Implementation of Year 1 of the K Pool Master Plan Program". The ISRP evaluated the proposal as "inadequate" due largely to its reliance on referencing the Master Plan as containing the detailed information and justifications. The Master Plan was not sufficiently abstracted in the proposal in a manner that the important technical background was adequately summarized. Consequently, the project scope of work proposed for FY'99 was substantially descoped and funded at approximately 1/3 the proposed budget. Although the FY 2000 proposal is again entitled " Begin Implementation of Year 1…", the work proposed for FY2000 builds on the work that will be accomplished in FY '99.

In addition to completion of the Master Plan the FY'99 objectives include initiation of the broodstock development portion of the white sturgeon propagation program described in the Master Plan, using the K Pools for this activity; and also include completing steps that support preparation of a new white sturgeon propagation facility. As stated above, it is anticipated that these objectives will be met in FY'99 and will support the work proposed herein for FY 2000. Material is excerpted from the Master Plan and placed in this proposal to facilitate its evaluation.

Sturgeon Historical Information - "The Problem"

Historically, white sturgeon were abundant in the Columbia River and its tributaries. Sturgeon were incidentally harvested in salmon gear in the 1870's to 1890's as part of non-Native Americans' commercial fishing, but were considered a safety hazard and nuisance. Non-Native American commercial fishers carelessly handled or killed large and small fish. As the Columbia River salmon runs declined in the late 1880's and early 1890's, the commercial value of fresh and smoked sturgeon increased. The average-sized sturgeon in the commercial catch was 150 lb, but 500-lb fish were common. The peak harvest year for sturgeon was 1892, when 5.5 million lb of flesh and secondary products sold for $41,000 (PSMFC 1992).

The sturgeon fishery in the lower Columbia River collapsed by 1894, causing commercial non-treaty fishers to travel upstream in search of fish large enough to harvest. The sturgeon fishery in the remaining river reaches collapsed by 1899. By 1910, sturgeon provided a minor regional fishery, associated primarily with net catches incidental to salmon harvest. The white sturgeon population was probably still recovering from this initial over harvesting when Bonneville Dam was constructed in 1937-38. This activity and subsequent dams have constrained the natural movement of sturgeon and isolated populations in the impoundments or pools behind the dams. This reservoir environment has also contributed to the decline of white sturgeon by altering the spawning and rearing habitat, restricting the movement of traditional sturgeon food sources (eulachon and lamprey), and favoring potential predators and competitors to the remaining sturgeon.

The Columbia River white sturgeon population started recovering in some areas with the protection of broodstock fish in 1950. The states enacted a maximum size limit of 6 ft with a 30-in. minimum. In 1958, the states raised the minimum size to 36 in. In 1957, Oregon and Washington State regulations prohibited commercial sturgeon fishing by non-treaty fishers in the Columbia River upstream from Bonneville Dam. In about 1974, with declining commercial salmon harvests caused by depressed upriver salmon runs, the commercial fishing industry began to target sturgeon fisheries to offset economic hardships. This resulting decline has significantly affected the use of sturgeon for subsistence and for economic benefits to tribal fishers and their families.

In recent years, the fisheries below Bonneville Dam supported a harvest of more than 50,000 white sturgeon annually. Factors favoring the sturgeon population in this free-flowing stretch of the Columbia River include access to the marine environment, greater availability of prey species, and consistently better hydrologic conditions during the spawning season than in other river reaches. The channel morphology of the lower Columbia River spawning area downstream from Bonneville Dam may be the key feature that influences the amount of high-quality spawning habitat. Because flow is funneled through the Columbia River gorge, water velocities remain consistently high even during periods of low discharge (DeVore et al. 1995a). Current harvest restrictions protect sturgeon stocks in this area from over-exploitation (DeVore et al. 1993).

In the Columbia River above Bonneville Dam, the sturgeon populations have survived in the various impoundments with varying degrees of success. For the most part, spawning habitat in Columbia River Basin impoundments is limited to areas directly below each dam, with the habitat quality dependent on discharge rate, substrate, and gradient. Notable exceptions are the free-flowing reaches of the Columbia and Snake Rivers, such as the Hanford Reach and Hells Canyon, where high-quality spawning habitat may exist well below the mainstem dams. In Zone 6, a combination of size regulations and shortening/changing the seasons to meet predetermined quotas has been enacted to control the total harvest of sturgeon. In The Dalles Dam and the John Day Dam pools, the sturgeon catches and catch per unit effort declined during 1989-91 (Hale and James 1993).

b. Rationale and significance to Regional Programs

In the mid-Columbia River dam impoundments above Priest Rapids Dam, the existing sturgeon stocks in several pools may not be reproducing. Sturgeon fisheries have also steadily declined since the building of dams and the impoundment of the Snake River. Little, if any, successful spawning may be occurring in some impounded reaches. Without enhancement, these pool populations may be headed for extinction. Viable sturgeon populations within the impoundments of the Columbia and Snake River system now depend on the persistent maintenance of strong year classes, which in turn depend on successful spawning and survival during several sturgeon life stages. Failure in a pool of one year class may not be significant, but failure of numerous year classes may have

marked effects on the survivability of a pool's sturgeon population. In 1993, this was summarized as follows.

> "Without successful reproduction or supplementation of fish in the impoundments, the probable consequence of current white sturgeon management strategies will at best be the further curtailing of recreational and commercial harvest opportunities, and at worst the extirpation of white sturgeon from vast reaches of the Columbia River." (Parsley et al. 1993).

A central hypothesis of Project 9603201 is that the K Pool supplementation program can become a valuable tool for reestablishing naturally spawning populations white sturgeon in the mid- and upper-Columbia River Basins. In conformance with Northwest Power Planning Council directions in Section 7.4B of the 1994 Fish and Wildlife Program, this project is consistent with relevant tribal, state, and federal plans, goals, and objectives, and the mitigation of potential adverse impacts and conflicts. A white sturgeon Impact Assessment Team, consisting of experts with diverse viewpoints on sturgeon enhancement, came to a consensus on the potential impacts to the ecological environment from the proposed sturgeon supplementation program. Some of the white sturgeon Impact Assessment Team members are on the Sturgeon Management Task Force.

While there may be little objection to capturing sexually mature sturgeon from non-recruiting or "dead" impoundments, experience from the Kootenai and Snake River sturgeon programs shows that capturing gravid females in sufficient numbers in certain years may be impossible. In addition, the taking of gravid wild females from pools with either healthy wild populations or marginal spawning success may not be allowed in the future because it may be believed that these gravid females are needed to support the local sturgeon population. By taking sub-adult sturgeon for the hatchery captive broodstock program, the fish would be removed from the wild population before the year classes involved undergo significant natural and fishing-related mortalities. If such an annual broodstock development program is successful, it may continuously provide many genetically diverse adults with little adverse effect on the remaining wild populations.

The K Pool white sturgeon supplementation effort is a production program, for which the YIN is specified as the lead agency. (Hatcher, et al. 1999). This is consistent with the YIN's desire to develop the ability to manage propagation and enhancement programs and facilities that directly produce fish in support of improving its treaty fisheries. However, close coordination will be maintained with other agency research and production programs so that regional objectives can be met and tasks are not duplicated.

c. Relationships to other projects

The overall goal of Project 9603201 is the establishment and enhancement of populations of white sturgeon in the mid and upper Columbia River basins. The project focus however, is on facility options and their development for conducting artificial propagation, not on determining where releases will eventually take place. This is recognized in the FWP language

which directs the development of a plan to evaluate the use of the existing K Pools as a biological and economically effective facility for fish propagation.

Projects 8605000 (ODFW) White Sturgeon Mitigation and Restoration and 8806400 (KTOI) Kootenai River White Sturgeon Studies and Conservation, include objectives related to sturgeon production activities such as spawning of captured gravid females, incubation of eggs and maturation of progeny. These and other project co-managers were asked to review and comment on the Master Plan. Not only were their comments constructive but they also served to assure that efforts are not duplicated.

It may be noted that the YIN shares a special relationship with Project 9700900 (NPT) Rebuilding White Sturgeon in Lower Snake River. The population of sturgeon that the Nez Perce are using in their Asotin County PUD facility were given to them by the YIN, from the K Pool population.

Relevant project fishery co-managers will participate further in decisions on how many fish are produced and where they will be released. This is expected to be accomplished through close system-wide coordination among agencies involved in the research and management of Columbia River Basin white sturgeon populations, as suggested by the Independent Scientific Review Panel (ISRP) in specific recommendation V-2B.2.c.2 (ISRP 1998).

As of this date, this project has not been organized into an “umbrella” group, nor is it critically related to other projects (as described in Section C). However, this project does have a “non-interdependent “ relationship to other projects as noted above and further emphasized in the discussion of the Objectives, Tasks and Methods which follow.

d. Project history (for ongoing projects)

From the 1950's to the 1970's, the K Pools provided cooling water to plutonium production reactors at the 100-K Area of the U.S. Department of Energy’s (DOE) Hanford Site. The K Pools are physically at the highest elevation of the K Area facilities, being 77 ft above the Columbia River, and are approximately 0.5 mi from the river.

The K Pools were constructed in the 1950's and were designed to receive water pumped directly from the Columbia River. Their function was to remove entrained particulate so that the water would not be abrasive to reactor cooling system components. The treated water then flowed from the K Pools in single-pass fashion through the reactors and back to the river without any possibility of contaminating the pools with radioactive material. Testing of water, fish, and sediment samples has confirmed the contamination-free nature of the K Pools and material associated with the pools (Herborn 1995). Except for some interim usage for the Hanford Site cleanup program, the K Pools have been essentially surplus to the DOE’s needs since the national defense mission ended in the 1970's.

The 100-K Area has 12 water treatment pools. Each football-field-sized K Pool has a water depth of 17 ft with a water surface open to the air of about 1 acre in area. Each pool can hold approximately 6.3 million gallons of water. Facilities and operable systems are in place at the 100-K Area to pump and control river water inflow and outflow from the K Pools through an outfall pipe back to the Columbia River.

Since the spring of 1993, many cooperative fish-rearing projects have been successfully conducted at the K Pools. The projects involving salmon and sturgeon are summarized as follows.

From early April to late May 1993, the WDFW sponsored a project in which 150,000 juvenile fall chinook salmon were reared to the smolt stage in a floating, tethered net pen. These salmon were subsequently released as "smolts" into the Columbia River from the nearby Priest Rapids Hatchery (Dauble et al. 1993).

In early May 1994, the YIN conducted the rearing of 500,000 URB fall chinook salmon juveniles grown out in 14 net pens. These fish were reared to smolt stage, and in mid-June 1994 were released directly into the Hanford Reach at the 100-K Area to begin their migration to the Pacific Ocean (Blodgett 1994).

In 1995 and 1996, the YIN conducted the rearing of 700,000 URB fall chinook salmon in 20 net pens. The YIN then released the juvenile salmon directly into the Hanford Reach of the Columbia River, directly north of the K Area. These years marked the start of the 9603201 Project and BPA funding.

In August 1993, several hundred white sturgeon, some of which are now 4 ft long and weigh 35 lb, were placed in a net pen. Two private companies, Stolt Sea Farm and FishPro, Inc., owned these sturgeon and had intended to raise them for the commercial restaurant market and as domestic broodstock to obtain eggs and young fish for sale to other aquaculturists. These plans were abandoned and the sturgeon were given to the Hanford K Area contractor. Some of these fish were subsequently given to the Nez Perce for their program at the Asotin Co. PUD facilities. The remainder of these fish, approximately 300, are now under the control of the Yakama Indian Nation (YIN) Fisheries Resource Management Program. The sturgeon rearing program has not involved BPA funding, but is described here to relate the valuable experience that has been gained by the YIN fisheries program and personnel in managing this species for the past five years.

In 1999, the project objectives include approval and publication of the Master Plan (and related development of information for technical questions which arise in the process, development of schedules, plans for updating permit compliance requirements, implementation planning such as a genetic risk plan, and a monitoring and evaluation plan, and coordination with other project managers.) Another 1999 objective is to initiate the white sturgeon broodstock development portion of the Master Plan, specifically, coordination with the U.S. Department

of Energy, the U.S. Environmental Protection Agency and the Washington State Department of Ecology regarding the use of Hanford facilities. Contracts for initiating installation of the white sturgeon broodstock facilities are to be placed. The design of experimental approaches for acclimation and "domestication" of captured sub-adult white sturgeon to be reared for broodstock, and the capture of sub-adults will be performed in cooperation with agencies and co-managers. The FY'99 work includes completing steps toward preparing a proposal for a new long range sturgeon propagation facility, e.g. development of site selection criteria and screening of potential sites and initiating the design of a single facility capable of meeting the needs of all white sturgeon propagation activities.

e. Proposal objectives

Objective 1: Continue white sturgeon broodstock development activities utilizing the K Pools.

Broodstock development means the rearing of females to maturation and subsequently keeping them as "domesticated" broodstock. This science has been developed in the California commercial sturgeon farming industry and is a much desired option to reliance on the capture of wild gravid females as a source of eggs.

In comparison to *spawning and hatching* and *juvenile rearing*, *broodstock development* is a long term, multi-year endeavor. In fact the time required for these three quite separate life cycle activities that the culturist must manage can be expressed as requiring *weeks, months, and years*, respectively. The time required for female sturgeon to reach sexual maturity is 15 to 20 years in the wild but can be reduced to 6 to 8 years when they are held in water at elevated temperatures.

The K Pools are particularly suited to the broodstock development phase of sturgeon culture. Existing K-Pool infrastructure, notably the large sand filters (as well as other structures), enable the recirculation of heated water as opposed to the use of a once-through flow system. The modifications needed at K Area to accommodate broodstock development are not extensive, compared to the construction of a new facility, and this activity can be completed in a very short time after the program is approved for funding.

In addition to the capability for recirculation of heated water, the immense K Pools offer a very versatile environment for testing rearing options. The river water delivery system, numerous existing large concrete pools and the configuration of the K Pools allow for concurrent operation of several types of production and experimental programs. Normative rearing conditions may be considered so that K Pool sturgeon will not be subjected to the shortcomings of traditional hatchery conditions.

Floating net pens are widely used in large rivers and lakes for fish rearing. The fish rearing programs conducted at the K Pools by the YIN have used floating net pens for containing the fish, with varying degrees of success. A salient feature concerning proper

net pen use is sufficient water movement through the nets, via currents or river flow, to supply fresh aerated water for the fish. Uneaten food and fish wastes must also pass through the nets and be carried away. The use of net pens at the K Pools, coupled with a pool water recirculation and spray system, for the most part, provided a satisfactory workable enclosure for the programs conducted to date.

Certain drawbacks exist in net pen rearing in the K Pool facilities. It tends to be labor-intensive, requiring frequent cleaning and exchanging of nets to combat algae buildup. Another distinct disadvantage is that the river water supply to the K Pools cannot be maintained as continuously flowing. The reason for this is that the only operational river pumps have a capacity of 32,000 gal/min, which is too oversized for continuous operation due to electrical power costs and water discharge permitting limits. Thus, to date, river water has been pumped to the K Pools for short durations each day to replace some of the 6-million-gallon pool volume with fresh river water. Supplying water in this "batch" manner could potentially subject fish in net pens in a pool to less-than-desirable water quality conditions because fish waste will continually collect on the pool floor and pathogen buildup can occur. The management of fish in net pens is problematic also since visibility and access by technicians is limited. Improvements in the overall rearing systems at the K Pools is planned and elaborated in the task/methods descriptions which follow.

Objective 2: Complete preparation of a proposal for a new white sturgeon propagation facility.

The Yakama Nation wishes to play a preeminent role in the restoration of white sturgeon in the Columbia River system. Such a position was adopted by Tribal Council on June 3, 1998. The Yakama Nation Fisheries Program also takes the position that a new modern facility should be designed and sited on the Columbia River with the capability for conducting all activities associated with sturgeon production. Selection of such a site and initiation of design is included in the scope of work for FY'99 and in this proposal for FY 2000.

Interim or even long term use of the K Pools is quite compatible with this position. The multi-year time required for broodstock rearing means that this endeavor could begin at the K Pools and continue during the development of a new facility and perhaps long into its operation.

Objective 3: Prepare and approve NEPA documentation covering the full program of white sturgeon propagation.

The status of NEPA and NPDES permitting compliance for K Area fish rearing activities is as follows. The U.S. Department of Energy categorically excluded the early K Pool small-scale, short-term Yakama Indian Nation fish-rearing activities from the requirement to prepare a *National Environmental Policy Act of 1969* (NEPA) environmental assessment or environmental impact statement. The DOE excluded these actions under

10 CFR 1021, Appendix D, Subpart B categorical exclusions: B1.20, "Small-scale activities undertaken to protect, restore, or improve fish and wildlife habitat, fish passage facilities (such as fish ladders or minor diversion channels), or fisheries; or B3.3, Research, inventory, and information collection activities that are directly related to the conservation of fish and wildlife resources and that involve only negligible animal mortality, habitat destruction, or population reduction."

However, in anticipation of a long-term lease of the K Pool facilities to the YIN for fish-rearing purposes, the DOE prepared a draft environmental assessment (EA) for public review. The DOE issued a final EA in December 1996. This EA includes proposed actions associated with the rearing of fish at the Hanford Site. As a result of this EA, the DOE made a "finding of no significant impact" determination. The EA addressed the holding of up to 500 white sturgeon. As the program grows, and as other facility usage comes on line, additional NEPA documentation will be required.

Previous YIN fish-rearing activities at the K Pools discharged rearing water to the Columbia River through effluent piping that connected to National Pollutant Discharge Elimination System (NPDES)-permitted 004 outfall (Permit Number WA-000374-3). The U.S. Environmental Protection Agency (EPA) issued this permit to the DOE on December 7, 1981, for all Hanford Site outfalls (including 004) operating in support of the DOE mission. Effluent limitations and monitoring requirements for discharges from outfall 004 also governed the K Pool fish-rearing operations. Future fish-rearing activities that would require Columbia River flows greater than the current 004 outfall limits would necessitate EPA approvals and/or an NPDES permit revision and new water discharge permits.

f. Methods

Objective 1 Task a. Complete white sturgeon broodstock development system(s) installation, including river water flow-through rearing tanks, pilot scale heated water recirculation systems and repairs to a portion of the K Pool infrastructure.

To overcome the shortcomings in the net pen and pool-wide rearing configurations, a new approach that is readily adaptable to the K Pool facilities has been designed. This approach will use K Pools in tandem, with one pool serving as a reservoir for clean river water and adjacent pools used for fish rearing in various configurations: tanks, raceways or larger less confined shallow structures installed on the pool floors. Continuous operation of new smaller river water pumps will supply river water to the reservoir pool or head pond. The tanks and raceways will be fed via gravity flow from the head pond, thus providing continuously flowing water for fish rearing. The series of tanks and raceways will discharge water into a common settling pond at the downstream end of the system to remove suspended solids, in compliance with NPDES requirements, before the effluent is returned to the river via the existing discharge outfall. Certain repairs of the K Pool infrastructure components, leaking valves in the pipeline from the river to the K Pools, installation of 480 v service at the pump house and heat tracing of a short portion of the pipeline, will be accomplished. This work will get under way in FY'99.

The FY'99 work of preparing the K Pool facilities by installing improved water flow-through systems of raw river water will be continued in FY2000. The initial requirements for holding captured sub-adults are quite modest. Four commercially available 20 ft diameter fiberglass tanks will provide sufficient capacity for holding 10,000 lb. of fish, thus providing for the first year's capture of up to 500 4 LB sub-adults, with considerable margin for fish growth and additional fish collection. Equipment needs are described below in Section g.

Accelerating the growth of brood fish during their immature growth phase may be a sensible way to speed up the program and reduce costs. The commercial white sturgeon aquaculture industry is based on the use of water at 70^{o} to 75^{o} F. A small recirculating system with heated water for experimental examination of accelerated growth of broodstock, capable of holding as many as 250 50 lb females at a water temperature of 70 ^{o}F will be installed. Equipment needs are described below in Section g.

Consideration of a normative rearing environment (e.g., water depth and flow, natural substrate and structure, cover, etc.) may prove beneficial for broodstock transition to hatchery environments. A portion of the captured sub-adults may be reared in a normative environment. It is expected that the sub-adults will be held for many years until they mature for spawning. The tremendous capacity of the K Pools will permit comparisons between the fish reared under normative and standard sturgeon aquaculture conditions with regard to mortality, size, growth rate, condition factor, and age at maturation.

Objective 1 Task b. In cooperation with appropriate agencies and co-managers, conduct tests of alternative approaches for acclimation and "domestication" of captured sub-adults to be reared for broodstock.

It is important to demonstrate that captured wild sub-adult sturgeon will survive in captivity and can be grown to sexual maturity. The simplest way to demonstrate this would be to maintain these fish in conventional hatchery circular pools or raceways and to wean them onto hatchery feed. For example, wild halibut have been caught and successfully adapted to a captive environment in this manner. If this approach proves difficult for wild sub-adult sturgeon, then trials can be made by feeding previously frozen salmon, trout, or some other fish to help make the gradual transition to captivity. Mortality rates of sub-adults will be closely monitored as they are weaned to hatchery feed, and adaptive management will be employed to address any difficulties.

Objective 1 Task c. In cooperation with appropriate agencies and co-managers, continue program of capture and transfer of sub-adult white sturgeon to build a population of broodstock.

Broodstock will be developed from sub-adult wild sturgeon captured in the lower Columbia River and various dam impoundments in trawl and haul operations, by long line

and sport fishing equipment, or other means. These sub-adults will be transported in properly equipped trucks to the K Pool facilities. These activities will be coordinated with the Project 8605000 white sturgeon research program , which has experience in the capture and transportation of sub-adult sturgeon

Objective 2 Task a. Complete preliminary design of a new facility and submit for review, approval and funding.

A new facility design, initiated in FY'99, will be completed. The design will be further developed upon selection of a new facility site. The generic design has the following components:

I A 32 tank broodstock system to hold 500 fish per year and grow them out to maturity

Develop conceptual facility layout
Design facility layout and site plan
Detailed design of tanks and other structures
Detailed design of plumbing and other water systems
Detailed design of aeration and other oxygenation systems including backup
Detailed design of electrical system and pump selection
Preparation of written operating manual

II A 24 tank system juvenile sturgeon system to growout 110,000 fingerlings to ¼ lb stockers

Develop conceptual facility layout
Design facility layout and site plan
Detailed design of tanks, filters and other structures
Detailed design of plumbing and other water systems
Detailed design of aeration and other oxygenation systems including backup
Detailed design of electrical system and pump selection
Preparation of written operating manual

III A 6 tank system for holding captured gravid females, hatching system, and 36 nursery tanks of various sizes

Develop conceptual facility layout
Design facility layout and site plan
Detailed design of broodstock holding tanks
Detailed design of hatchery system
Detailed design of nursery system
Detailed design of plumbing and other water systems

Detailed design of aeration and other oxygenation systems including backup
Detailed design of electrical system and pump selection
Preparation of written operating manual

Objective 2 Task b. Complete selection of and integration of additional sites into a program for interim and/or ongoing use in conducting all phases of white sturgeon propagation activities.

As the Master Plan was being written, it became apparent that alternative sites to the Hanford K Pools could play a significant role in the overall program of white sturgeon propagation. The three life management phases, described under Section e, Objective 1, vary considerably in their needs. The process of handling captured gravid females to extract eggs, and the subsequent incubation of those eggs, can benefit greatly from the use of a site that is already equipped with the requisite facilities, including - for example - a laboratory. The Abernathy Center was identified as a site that could undertake these activities at minimal start-up costs and in an early time frame. The Center would however need to supplement its infrastructure with some additional capability. Those needs were tentatively identified and preliminary cost estimates were made. This task will undertake the implementation of those needs, first by completing a more detailed selection of alternative sites, firming up cost estimates and finalizing arrangements.

Objective 3 Prepare and approve NEPA documentation covering the full progam of white sturgeon propagation.

The need for additional NEPA documentation will be determined, taking into account the planned expansion of operations at the K Pools and the use of other existing sites in the early implementation of the white sturgeon propagation program. The status of NEPA documentation at alternative sites which can play a role in the project will be determined.

g. Facilities and equipment

Raw river water system for holding captured sub-adults (Objective 1, Task a) will consist of equipment, capital expenditures, as follows:

20’ diameter fiberglass tanks (4)
Biodek media (for gas strippers)
Sump pump
Tools (Impact drill)
Valves

Heated water recirculation system for experimental acceleration of growth will consist of equipment, capital expenditures, as follows:

20 ft diameter fiberglass tank (1)
10 ft diameter fiberglass tanks (2)
4000 gallon fiberglass sump
1.5 Hp pump
Biodek media
Head tank
Fluidized bed
Ozone generator
Water heater
Hot water head tanks
Circulating pump
Air blower
Electrical controls
Auto feeders with controls
Alarm sensors
Continuous monitoring equipment
Valves

The purchase of a new small volume, 2500 gpm, river water pump and associated valves and fittings is included in the FY'99 budget.

h. Budget

Personnel

YIN Fisheries Resource Management Program personnel costs consist of three man months each of manager, biologist and bookkeeper.

Fringe benefits

Fringe benefits are applied at 25.3%.

Supplies, materials, non-expendable property

Material needs include requirements for installation of a 4 tank raw river water flow-through system. The system will include a two compartment settling basin and sludge hopper; rebar , rebar anchors; forms, PVC pipe and fittings and steel for drain screens, stripper frames and basin channels.

Materials required for installation of the small scale experimental heater water recirculating system are air piping and materials, oxygen piping and materials and PVC pipe and fittings.

Materials are required for making repairs to the existing site infrastructure which include repair of three existing valves in the pipeline from the river pump house to the K Pools, installation of 480 v electrical service to the pump house for power to the 2500 gpm pump, and heat trace of a short portion of the pipeline that is above ground.

An allowance for incidental supplies and material needs, based on the past five years of experience of conducting fish rearing activities at the K Pools is included.

O & M

O & M costs are not listed as a line item; all items in the budget proposal, with the exception of capital equipment, may be considered O & M.

Capital acquisitions or improvements (e.g. land, buildings, major equip.)

These are the equipment items shown above under Section 8 g, "facilities and equipment", which are required for the raw river water system for holding captured sub-adults (Objective 1, Task a) , and the heated water recirculation system for experimental acceleration of growth of maturing broodstock.

NEPA costs

NEPA costs are distributed among other line items: travel, subcontracts and indirect, which total $17,118, and represent 4% of the proposed budget.

Construction-related support

Completion of the new facility design and applying it to the selected site represents a "construction related cost".

PIT tags

The procurement of up to 500 PIT tags is assumed, based on the intended collection of that many sub-adult white sturgeon.

Travel

Travel costs include YIN personnel mileage and subcontractor travel in conjunction with NEPA documentation and site work coordination, including both vehicle mileage, air fare and per diem.

Indirect costs

Indirect costs are applied to all items except equipment, at 26.8%

Subcontractor

Subcontractors include a local Tri-Cities firm, GTS Duratek, who has furnished a craftsman, Stan Owsley, to perform work for the YIN program at the K Area in the past. Sole source justifications have been approved for Mr. Owsley, as well as the other subcontractor consultants listed below. GTS Duratek will be contracted for installing the systems and making the repairs described in Objective 1 Task a.

Nick Anderson has served as project / program coordinator, managing the routine interface between the YIN and the U.S. Department of Energy offices and Hanford site contractors. He also has "recruited" the other subcontracted consultants and performs a team leader role.

Dan Herborn serves as a consultant, with primary responsibilities for all permitting compliance including NEPA documentation. He played a major role in preparation of the Master Plan, organizing the input of all other contributors. He also established and moderated the review teams and an "interested party" review of the Master Plan. He will continue in these activities.

Tom Macy has interfaced with co-managers and agencies to develop the Master Plan. He will assist in finalizing the selection of a new site in conjunction with the proposed Objective 2 Task b.

Gary Grace is the president of AquaGen Engineers, a California firm with registered professional engineer responsibility for facility design, both the improvements to be installed at the K Pools and the proposed design of a new facility.

Dr. John Forster is past president of a division of the Norwegian company, Stolt Sea Farm, that was among the pioneers of commercial sturgeon culture. He advises on sturgeon rearing systems and economics. He maintains valuable contacts throughout the world of white sturgeon and is called upon for specific needs as they arise within the YIN program.

Yakama Industries is a company owned and operated by YIN tribal members. Yakama Industries will be contracted to perform routine fish technician duties at the K Pools, upon initiation of the broodstock development activities.

Section 9. Key personnel

Lynn Hatcher
Project Manager
Yakama Indian Nation
Fisheries Resource Management Program

Section 10. Information/technology transfer

The information obtained from the project will be distributed by submittal of an annual report to the Bonneville Power Administration and by sharing data and the status of work in progress with co-managers and the Sturgeon Management Task Force.

Congratulations!